

WHAT IS CLAIMED IS:

1. A method for processing a rubber composition by a multi-stage mixing procedure comprising at least one non-productive stage and a productive stage:

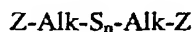
5 (A) wherein said non-productive stage is characterized by mixing a rubber composition at a rubber temperature in a range of from 140°C to 190°C for a mixing time of from 1 to 20 minutes, and said rubber composition comprises

(1) 100 parts by weight of at least one sulfur vulcanizable elastomer wherein

10 (a) from 40 to 100 parts by weight of said vulcanizable elastomer is a multi-viscoelastic response rubber; and

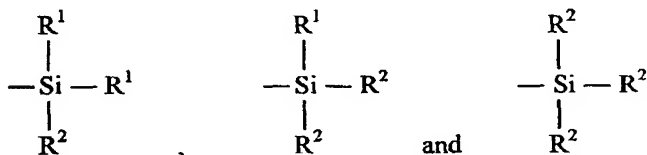
(b) from zero to 60 parts by weight of said vulcanizable elastomer is a rubber containing olefinic unsaturation other than said multi-viscoelastic rubber;

15 (2) from 0.1 to 25 phr of an organosilicon compound of the formula:



in which Z is selected from the group consisting of

20



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where R<sup>1</sup> is an alkyl group of 1 to 4 carbon atoms, cyclohexyl or phenyl; R<sup>2</sup> is alkoxy of 1 to 8 carbon atoms, or cycloalkoxy of 5 to 8 carbon atoms; Alk is a divalent hydrocarbon of 1 to 18 carbon atoms and n is from 2 to 8,

30 (3) from 10 to 250 phr of a silica filler; and

(4) the absence of zinc oxide to form a non-productive compound;

(B) wherein said productive stage is characterized by mixing at a rubber temperature not to exceed 120°C, and the productive stage compound contains

(1) said non-productive compound;

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(2) from 0.5 to 5 phr of a sulfur vulcanizing agent; and

(3) from 1 to 8 phr of zinc oxide.

2. The method of claim 1 wherein said multi-viscoelectric response rubber is an emulsion styrene-butadiene rubber composition comprised of

5 (A) a high molecular weight styrene-butadiene rubber having a weight average molecular weight of at least about 300,000 and

(B) a low molecular weight styrene-butadiene rubber having a weight average molecular weight which is less than about 280,000;

10 wherein the ratio of the high molecular weight styrene-butadiene rubber to the low molecular weight styrene-butadiene rubber is within the range of about 80:20 to about 25:75; wherein the styrene-butadiene rubber composition is made by coagulating a blend of a latex of the high molecular weight styrene-butadiene rubber and a latex of the low molecular weight styrene-butadiene rubber.

15 3. The method of claim 1 wherein said multi-viscoelastic response rubber is a styrene-butadiene rubber composition which is comprised of repeat units which are derived from styrene and 1,3-butadiene, wherein the styrene-butadiene rubber composition has a number average molecular weight as determined by thermal field flow fractionation which is within the range of about 50,000 to 150,000 and wherein  
20 the styrene-butadiene rubber has a light scattering to refractive index ratio which is within the range of 1.8 to 3.9.

4. The method of claim 1 wherein said multi-viscoelastic response rubber is a styrene-butadiene rubber composition which is comprised of repeat units which are  
25 derived from styrene and 1,3-butadiene, wherein a plot of log frequency versus storage modulus of the styrene-butadiene rubber composition crosses over a plot of log frequency versus loss modulus of the styrene-butadiene rubber composition at a frequency within the range of 0.001 radians per second to 100 radians per second when conducted at 90°C to 120°C using parallel plate geometry in the dynamic oscillation  
30 frequency sweep of the styrene-butadiene rubber.

5. The method of claim 1 wherein the Mooney ML 1+4 viscosity at 100°C

of the high molecular weight styrene-butadiene rubber ranges from 80 to 160 and the Mooney ML 1+4 viscosity at 100°C for the low molecular weight styrene-butadiene rubber ranges from 2 to 40.

5           6.     The method of claim 1 wherein said sulfur vulcanizable elastomer containing olefinic unsaturation other than multi-viscoelastic rubber is selected from the group consisting of natural rubber, polyisoprene, butyl rubber, halobutyl rubber, polybutadiene, styrene-butadiene copolymer, styrene/isoprene/butadiene rubber, methyl methacrylate-butadiene copolymer, isoprene-styrene copolymer, methyl  
10 methacrylate-isoprene copolymer, acrylonitrile-isoprene copolymer, acrylonitrile-butadiene copolymer, silicon-coupled star-branched polymers, tin-coupled rubbers, star-branched polymers, siloxy-terminated elastomers and mixtures thereof.

15           7.     A sulfur vulcanizable rubber composition which is prepared by the method of claim 1.

          8.     A sulfur vulcanizable rubber composition which is prepared by the method of claim 2.

20           9.     A sulfur vulcanizable rubber composition which is prepared by the method of claim 3.

          10.    A sulfur vulcanizable rubber composition which is prepared by the method of claim 4.

25           11.    A sulfur vulcanizable rubber composition which is prepared by the method of claim 5.

30           12.    A sulfur vulcanizable rubber composition which is prepared by the method of claim 6.

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13. A sulfur vulcanized rubber composition which is prepared by heating the composition of claim 7 to a temperature ranging from 140°C to 190°C in the presence of a sulfur vulcanizing agent.

5 14. The sulfur vulcanized rubber composition of claim 13 in the form of a tire, belt or hose.

10 15. A sulfur vulcanized rubber composition which is prepared by heating the composition of claim 8 to a temperature ranging from 140°C to 190°C in the presence of a sulfur vulcanizing agent.

15 16. A sulfur vulcanized rubber composition which is prepared by heating the composition of claim 9 to a temperature ranging from 140°C to 190°C in the presence of a sulfur vulcanizing agent.

20 17. A sulfur vulcanized rubber composition which is prepared by heating the composition of claim 10 to a temperature ranging from 140°C to 190°C in the presence of a sulfur vulcanizing agent.

25 18. A sulfur vulcanized rubber composition which is prepared by heating the composition of claim 11 to a temperature ranging from 140°C to 190°C in the presence of a sulfur vulcanizing agent.

19. A sulfur vulcanized rubber composition which is prepared by heating the composition of claim 12 to a temperature ranging from 140°C to 190°C in the presence of a sulfur vulcanizing agent.

20. A tire having a tread comprised of the composition of claim 14.

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